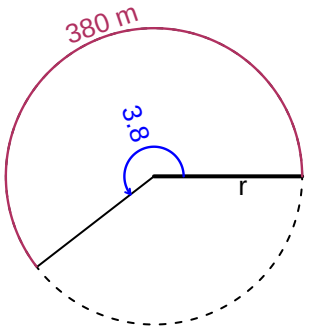
Name: Date:

Trig Final (SLTN v609)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.8 radians. The arc length is 380 meters. How long is the radius in meters?

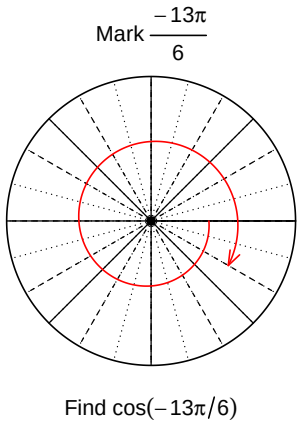


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

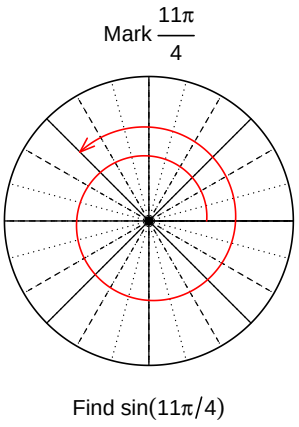
$r = 100$ meters.

Question 2

Consider angles $\frac{-13\pi}{6}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{6}\right)$ and $\sin\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-13\pi/6)$



Find $\sin(11\pi/4)$

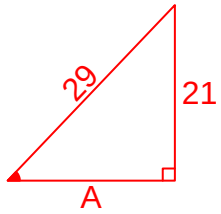
$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-21}{29}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

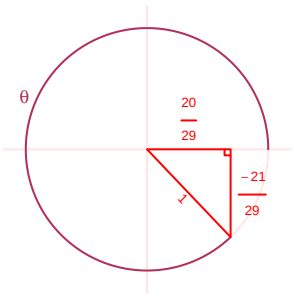
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 21^2 = 29^2$$
$$A = \sqrt{29^2 - 21^2}$$
$$A = 20$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-21}{29}}{\frac{20}{29}} = \frac{-21}{20}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.94 Hz, a midline at $y = 7.9$ meters, and an amplitude of 2.51 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.51\sin(2\pi 3.94t) + 7.9$$

or

$$y = -2.51\sin(7.88\pi t) + 7.9$$

or

$$y = -2.51\sin(24.76t) + 7.9$$